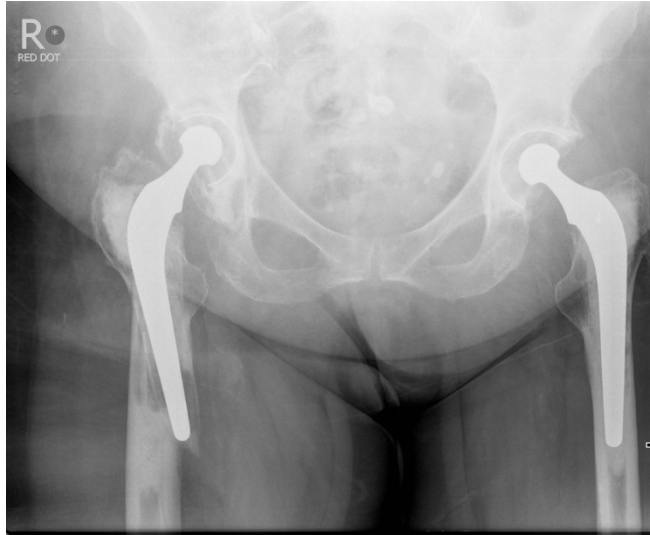


Management of Vancouver B3 Fractures Bone Loss



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Professor & Chairman

Academic Department Trauma & Orthopaedics
School of Medicine, University of Leeds, UK

Vancouver Classification



Type and Subtype	Location and Characteristics
Type A	
A	Greater trochanter
A ^G	Lesser trochanter
L	
Type B	
B1	Around stem or stem tip; stem well fixed
B2	Around stem or stem tip; stem loose
B3	Around stem; stem loose, poor proximal bone stock
Type C	Distal to stem

The B3



- Loose femoral component
- Severe bone stock loss
- Rare

Risk factors

- Major risk factors are

Osteoporosis

Osteolysis/particulate matter induced osteolysis³

Revision arthroplasty⁴

3. Heekin RD, Engh CA, Herzurm PJ (1996) Fractures through cystic lesions of the greater trochanter. A cause of late pain after cementless total hip arthroplasty. J Arthroplasty 11:757–760

4. Duwelius PJ, Schmidt AH, Kyle RF, Talbott V, Ellis TJ, Butler JB (2004) A prospective, modernized treatment protocol for periprosthetic femur fractures. Orthop Clin North Am 35:485–492

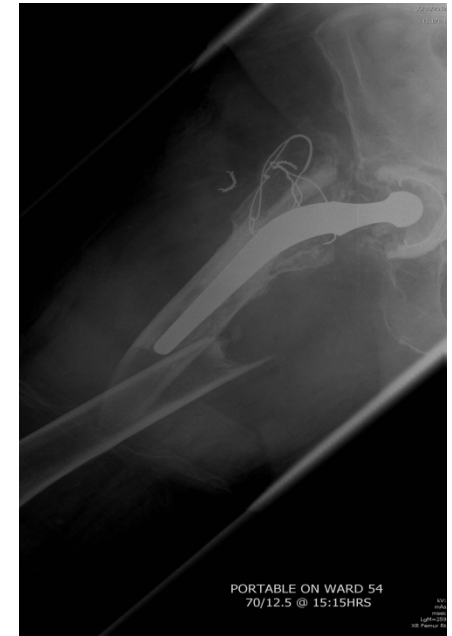
Treatment Issues for B3

- Issues- Aseptic loosening?
Bone loss
Fracture
To be dealt in a single setting



Options of Treatment for B3

- No single ideal technique
- Different available options for the treatment of these fractures



1. Macdonald SJ, et.al. Periprosthetic femoral fractures treated with a long-stem cementless component. J Arthroplasty. 2001;16:379-83
2. Berry DJ. Treatment of Vancouver B3 periprosthetic femur fractures with a fluted tapered stem. Clin Orthop Relat Res. 2003;417:224-31
3. Parvizi J, Sim FH. Proximal femoral replacements with megaprotheses. Clin Orthop Relat Res. 2004;420:169-75
4. Wong P, Gross AE. The use of structural allografts for treating periprosthetic fractures about the hip and knee. Orthop Clin North Am. 1999;30:259-64
5. Kantor GS, et.al. Resection arthroplasty following infected total hip replacement arthroplasty. J Arthroplasty. 1986;1:83-9

Options

- Proximal femoral allograft
- Implant
 - Cemented
 - Uncemented

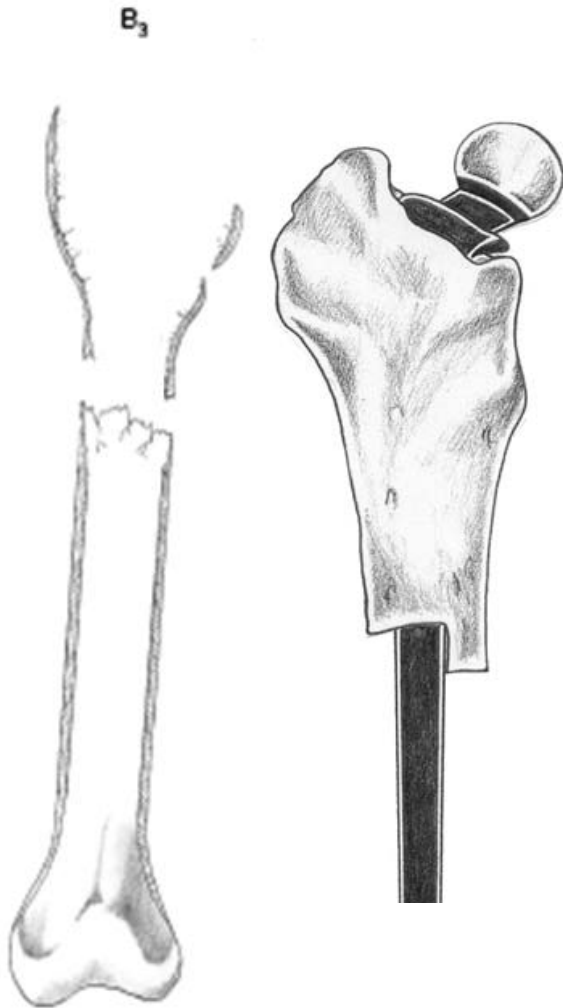


Proximal Femoral Allograft

- Bulk Allograft
- Impaction Grafting



Proximal Bulk Allograft



Composite of

- proximal femur allograft
- long stem femoral prosthesis

Proximal Bulk Allograft



Allograft:

Preparation

(irradiation/Freezing)

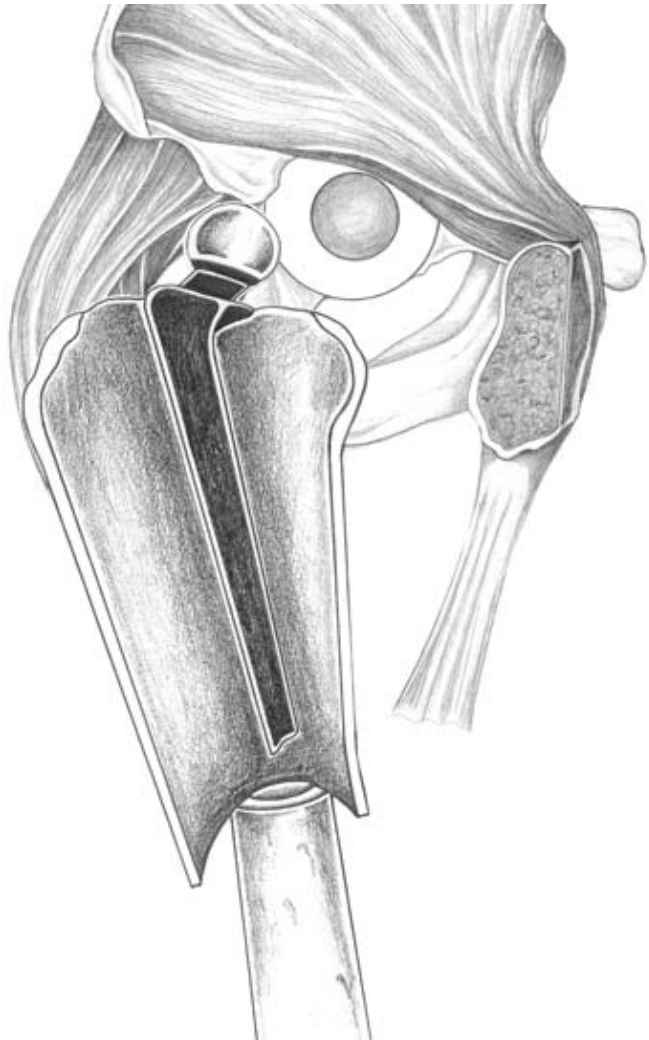
Soft tissues removed

Canal Preparation

Implant fixation

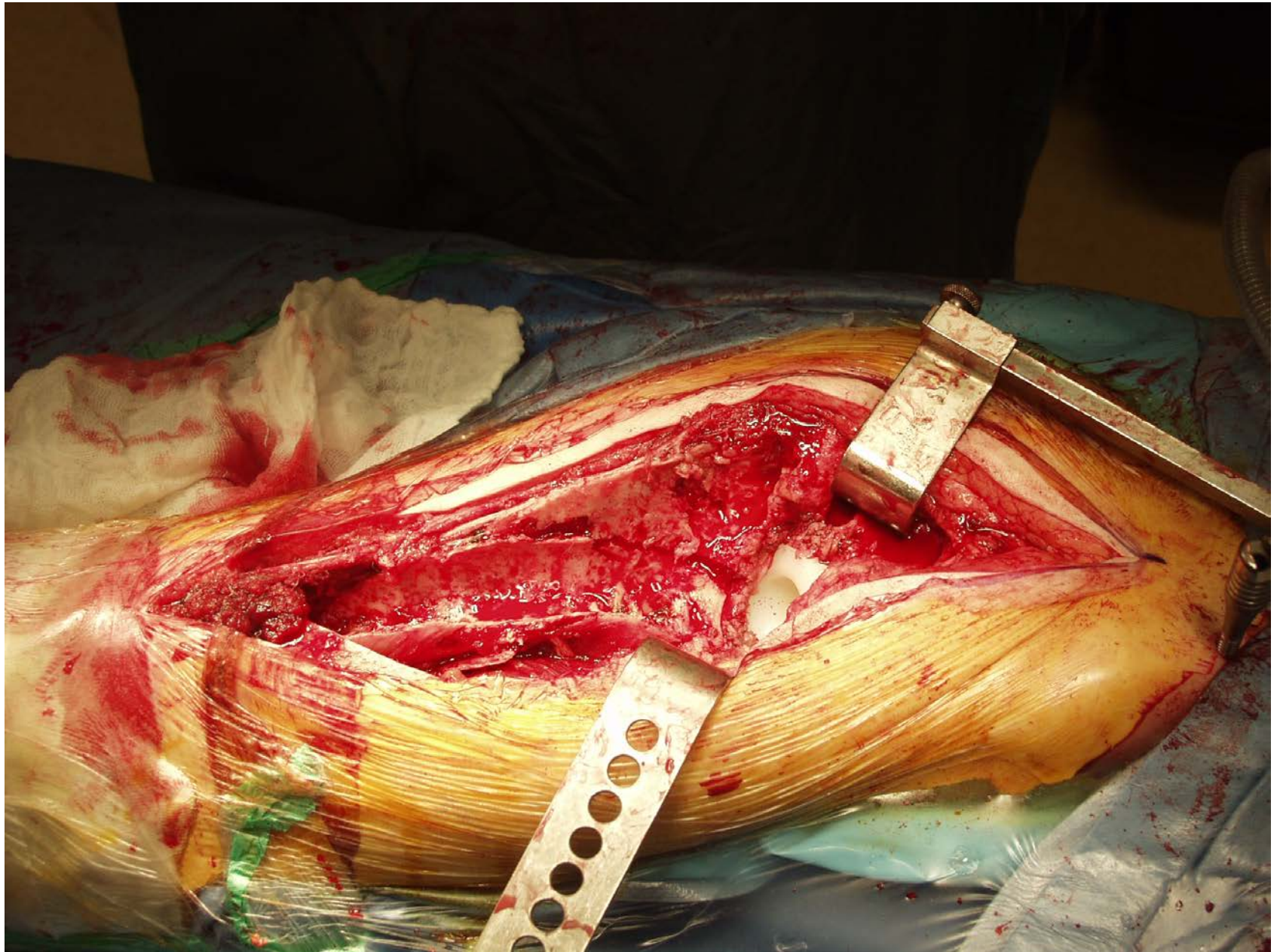


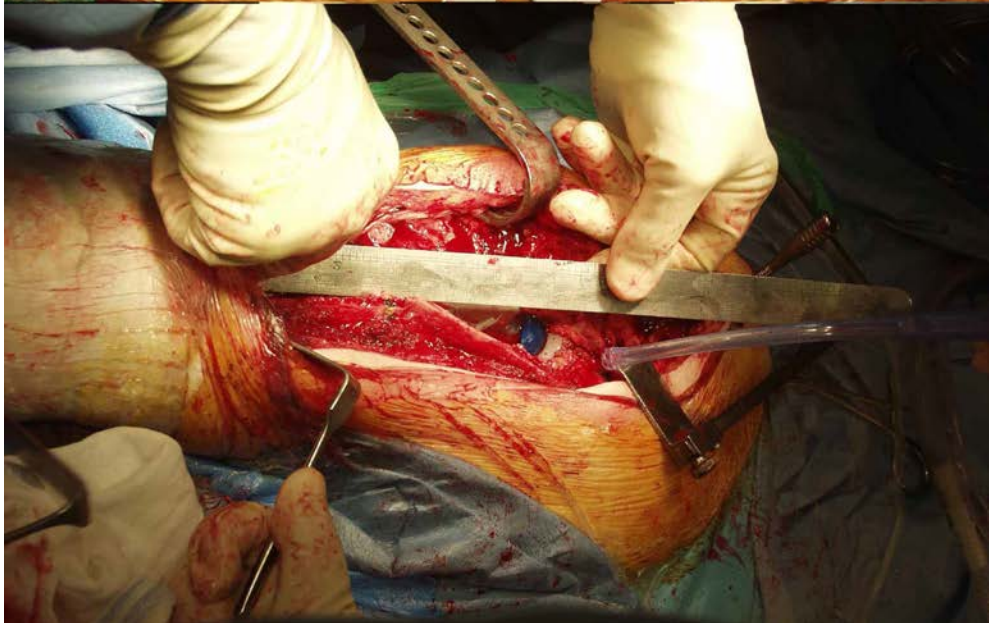
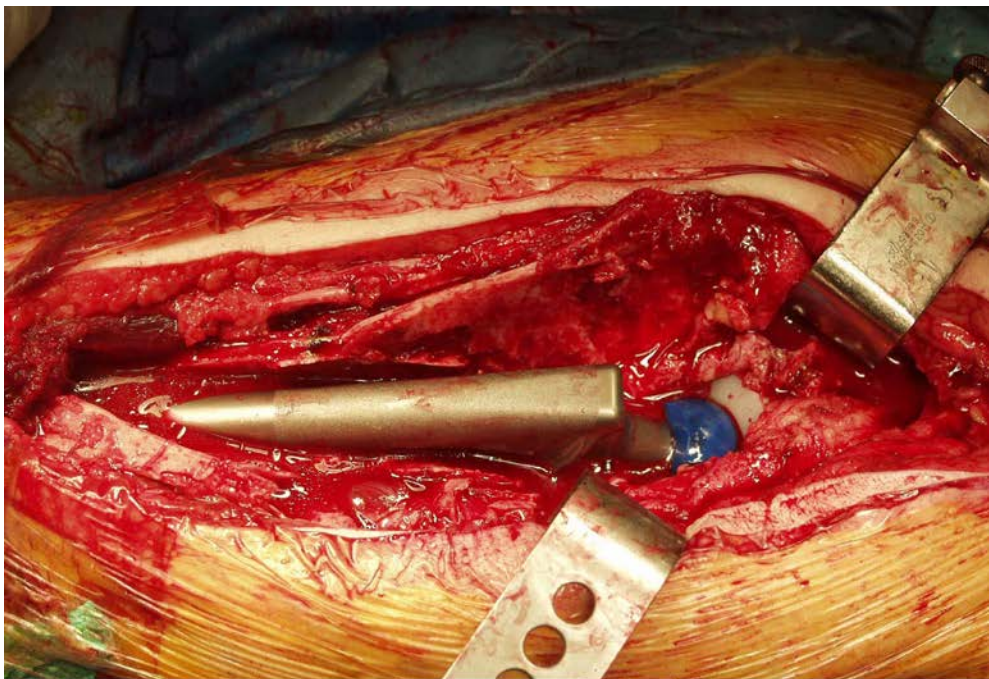
Proximal Bulk Allograft



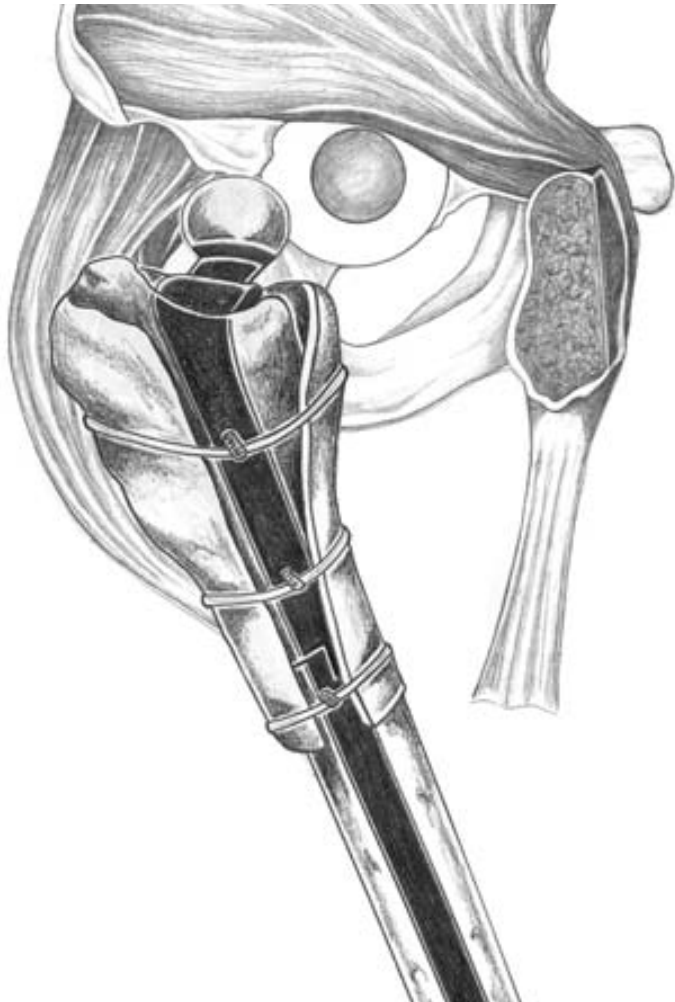
Host preparation

- Sliding Trochanteric Osteotomy
- Prosthesis and Cement removed
- Step cut osteotomy of distal fragment to improve stability

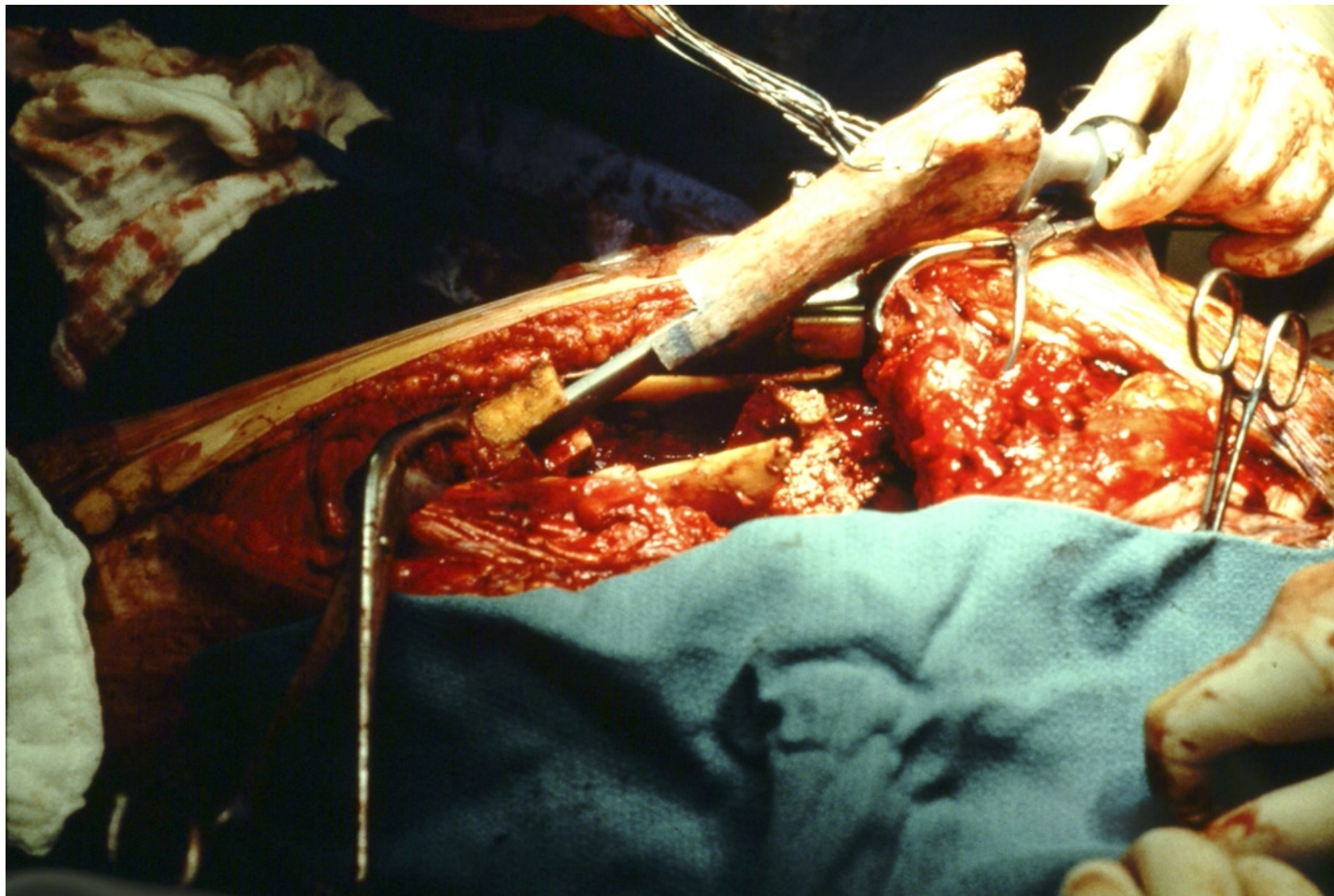


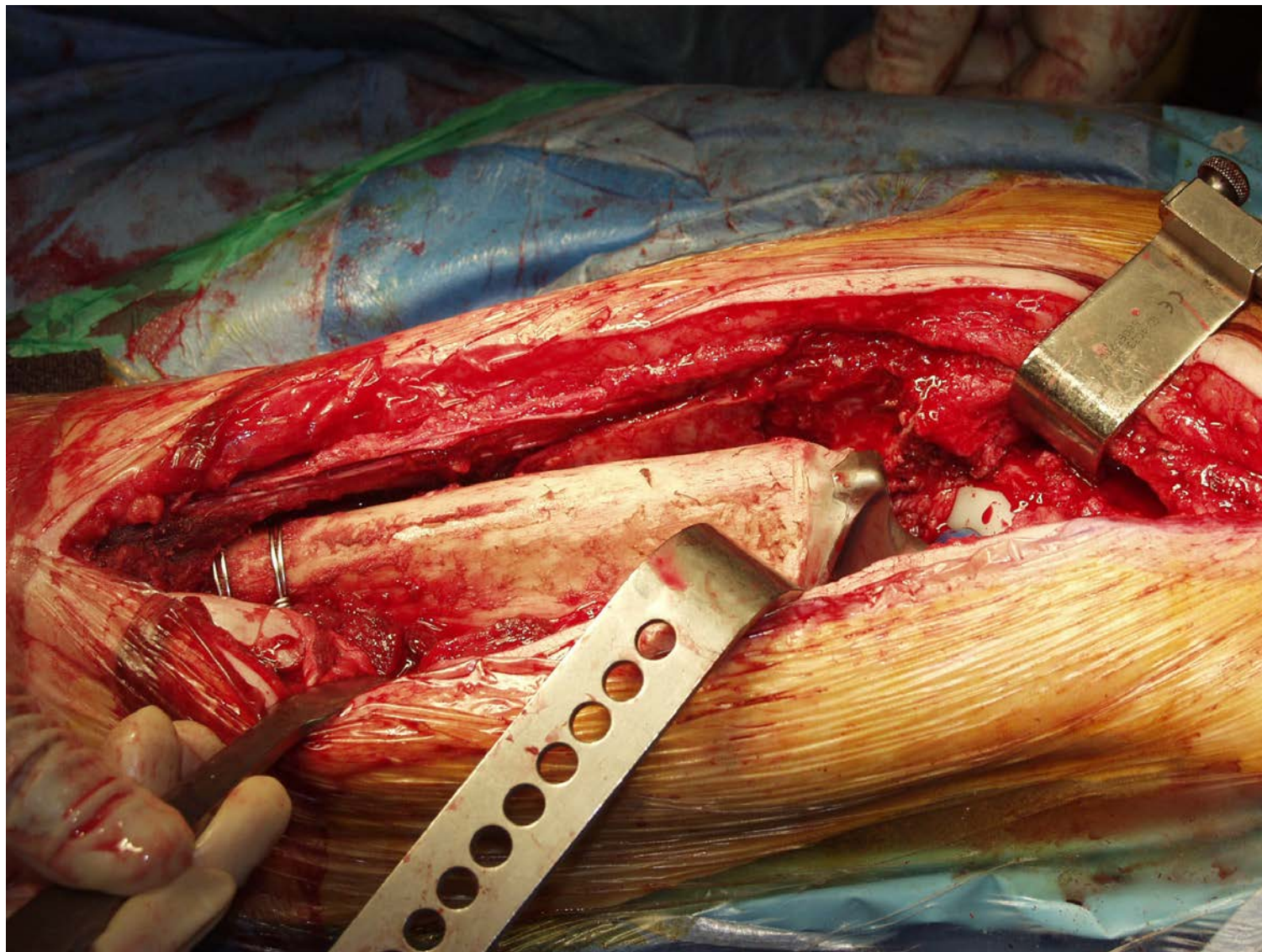


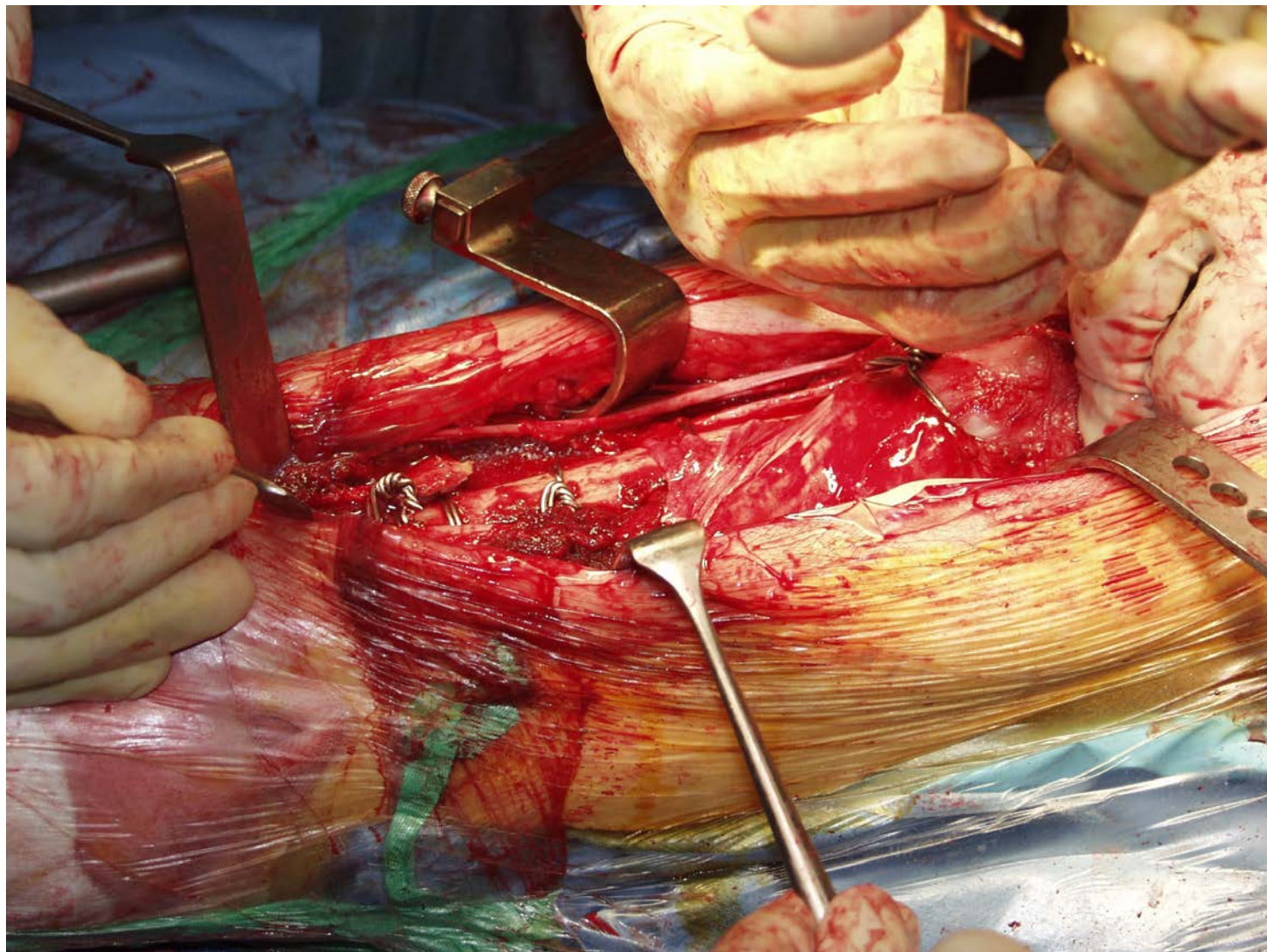
Proximal Bulk Allograft



Allograft insertion and fixation







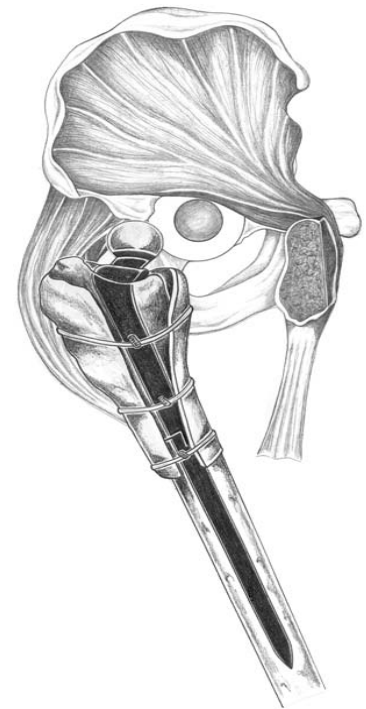
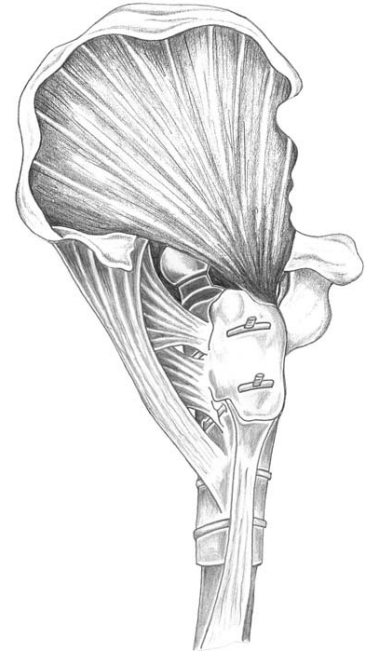
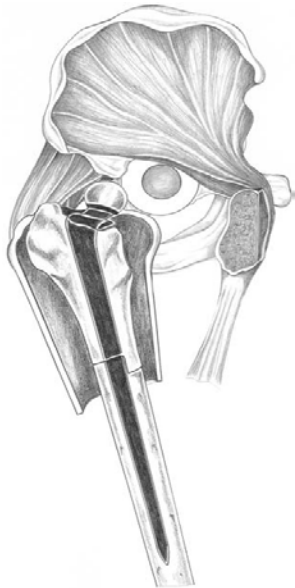
Proximal Bulk Allograft

Advantages

- Bone stock reconstitution
- Reattachment of soft tissues
- Osseous union of the host greater trochanter

Disadvantage

- Technically demanding
- Non weight bearing 3-6 months



PROXIMAL FEMORAL ALLOGRAFT TREATMENT OF VANCOUVER TYPE-B₃ PERIPROSTHETIC FEMORAL FRACTURES AFTER TOTAL HIP ARTHROPLASTY

BY ANTHONY C. MAURY, MSc, FRCS(T&O), ARI PRESSMAN, MD, FRCSC, BARRY CAYEN, MD,
PAUL ZALZAL, MD, FRCSC, DAVID BACKSTEIN, MD, FRCSC, AND ALLAN GROSS, MD, FRCSC

Investigation performed at Mount Sinai Hospital, Toronto, Ontario, Canada

Conclusions: The use of a proximal femoral allograft for the treatment of a Vancouver type-B₃ periprosthetic femoral fracture can provide a satisfactory result in terms of pain relief and function at five years.



Proximal Bulk Allograft

Maury et al. (2006)

Retrospective review

35 hips (1989 – 2001)

5.1 years

Half died or lost to follow up

Walking distance limited / no or mild Pain

4 (16%) Re-revision

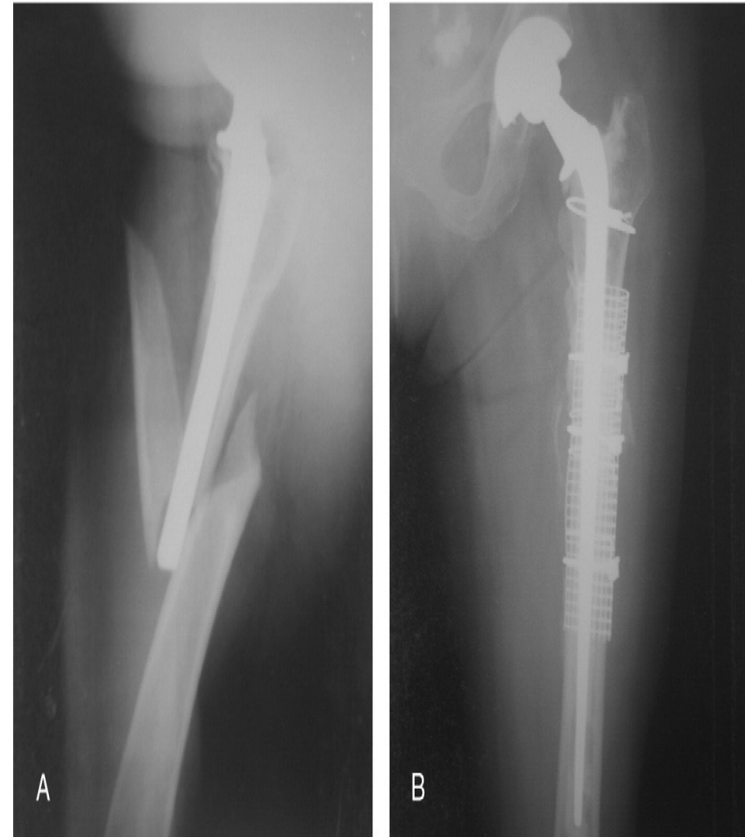
Proximal Femoral Allograft

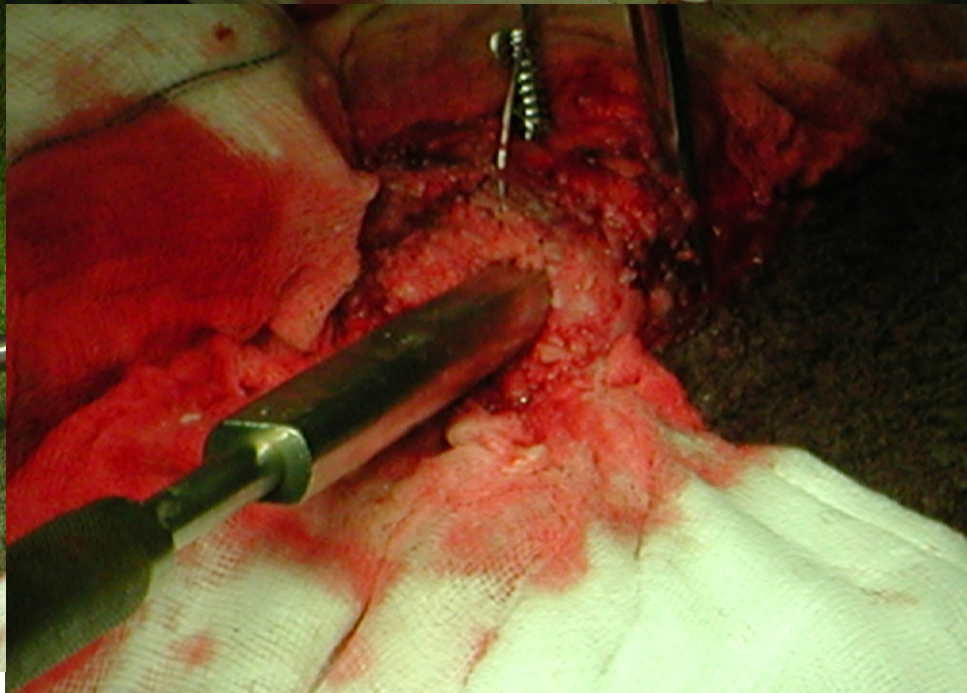
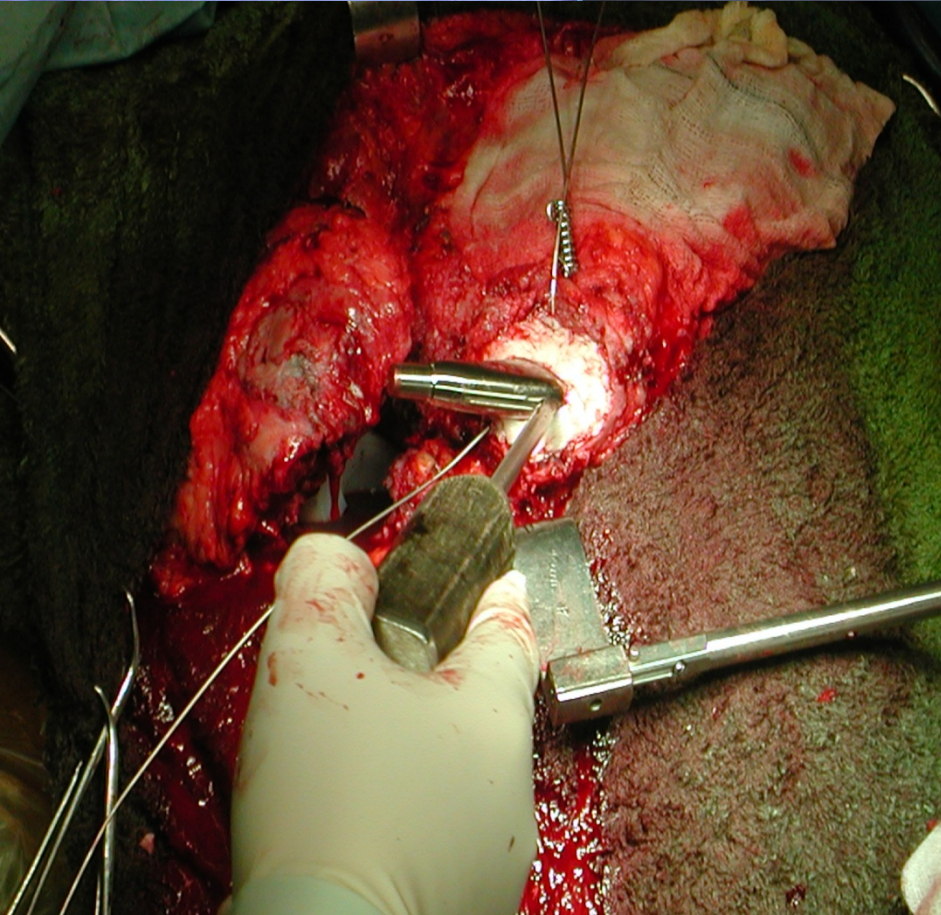
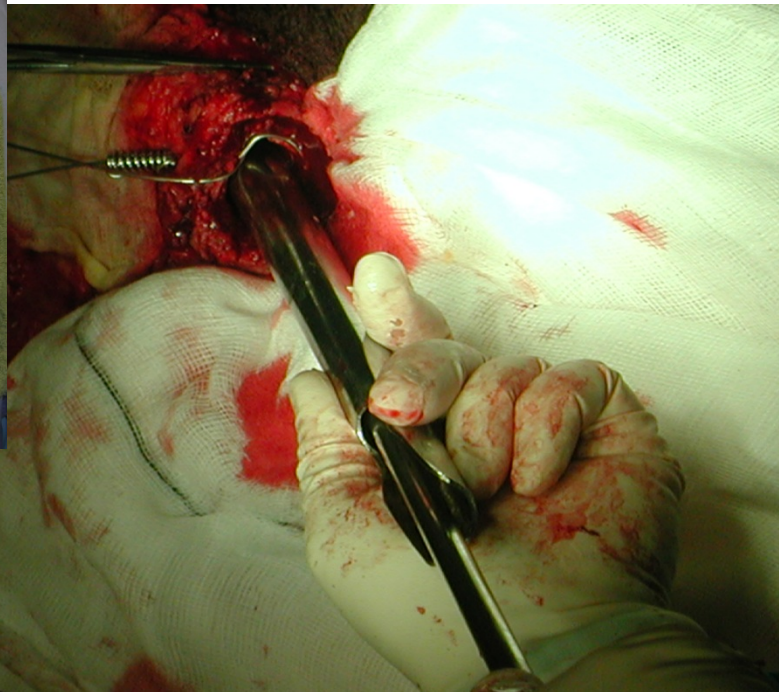
- Bulk Allograft
- Impaction Grafting



Impaction Grafting

- Cemented femoral prosthesis
- The stem to by pass the fracture by 2 cortical diameters at least
- Stem > 200mm
- Ample fresh frozen irradiated corticoncellous allograft (>270ml)
- Mesh to by-pass 2 cortical diameters at least above and below fracture line





- Exeter experience

- 144 fractures

- Higher union rate impaction grafting vs without

- Concerns

- Biocompatibility

- Allograft viability

- Technically demanding



Options

- Proximal femoral allograft
- Implant
 - Cemented
 - Uncemented



Implant

By-pass the fracture

Primary Stability

Proximal femur
wrap



- Cement
- Diaphyseal fit
- Distal fix
- Tumour prosthesis
/ megaprosthesis

- Cemented
- Diaphyseal fit
- Distally fixed
- Tumour prosthesis / megaprosthesis

- Zaki (Wrightington), *JOS*, 2007
- 22 B3 – no nonunions



- Cemented
- Diaphyseal fit
- Distally fixed
- Tumour prosthesis / megaprosthesis

•O'Shea et al, *JBJS Br*, 2005

22 patients - 20 united

- 18 excellent outcome
- subsidence in 2 (10-15%)
- thigh pain in 1 (10%))
- delayed union 1
- deep infection 1



- Cemented
- Diaphyseal fit
- Distally fixed
- Tumour prosthesis / megaprosthesis

- Wagner tapered fluted:**

- immediate axial and rotational stability with less bone contact
- potential strut grafts or structural allografts to increase bone stock
- enhance bone formation



- Berry DJ. *Clin Orthop Relat Res* 2003
- Gutiérrez Del Alamo, *J Arthroplasty*. 2007
- Boehm, *JBJS Br Supp* 2005

- Cemented
- Diaphyseal fit
- Distally fixed
- Tumour prosthesis / megaprosthesis

•Uncemented stems with distal locking screws

- when bone stock is extremely poor
- when fracture line extends beyond isthmus

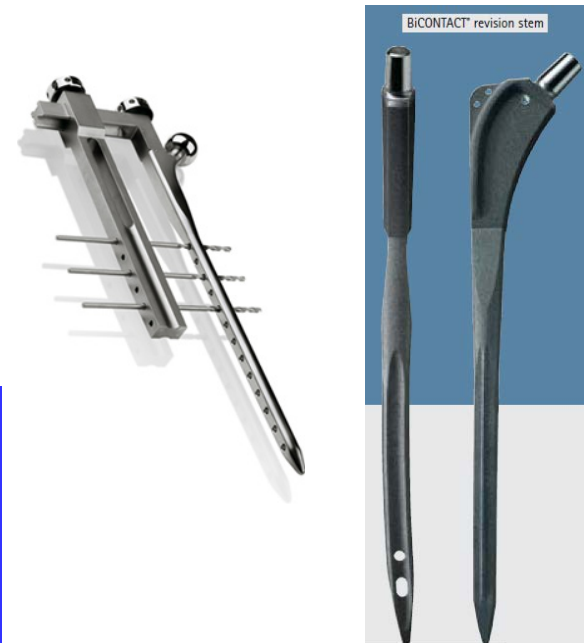
Clift B, JBJS Am. 2000

Kent: Rigby M, *Injury* 1998.

Stossel CA, *AAOS*, 2004

BiContact: Eingartner C, *Int. Orthop* 2004

Prosthesis Nail: Probst A, *Unfallchirurg* 2003



Uncemented stems with distal locking screws

- Unpredictable effectiveness unless stability has been secured before screw insertion
- Use of long tested stems is recommended
 - Lewallen DG, Berry DJ, *JBJS Am* 2000
- Fatigue and screw failure because of failure of proximal stem integration
 - Learmonth ID, *JBJS Br.* 2004



- **Modular Wagner-type** stems are preferable because they compensate for distal migration of the stem

- limb shortening
- ↑ dislocation risk

Kolstad K, *Acta Orthop Scand* 1994.
Stoffelen DV, *Acta Orthop Belg* 1995.



- Cemented
- Diaphyseal fit
- Distally fixed
- Tumour prosthesis / megaprosthesis



•Megaprosthesis

- A last resort in the elderly
 - low expectancy life
 - low demands
 - immediate mobilization
- Dislocation is the commonest complication (10%)
- In cases with intraoperative instability use of big heads or constrained liners is recommended
- Klein GR, *JBJS Am*, 2005



PROXIMAL FEMORAL REPLACEMENT FOR THE TREATMENT OF PERIPROSTHETIC FRACTURES

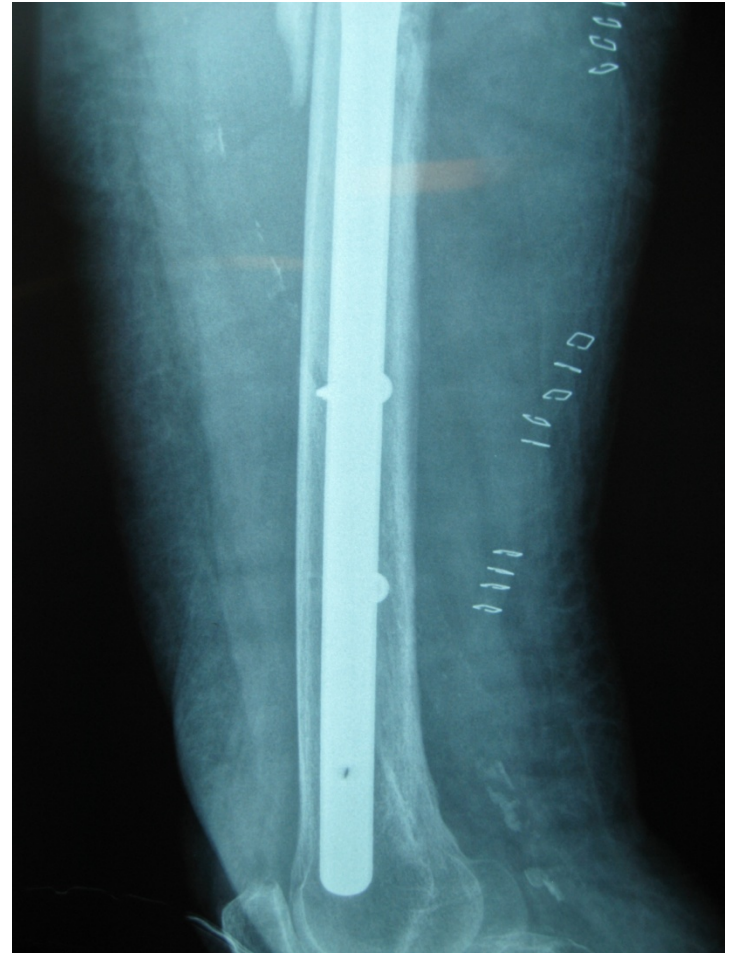
BY GREGG R. KLEIN, MD, JAVAD PARVIZI, MD, VENKAT RAPURI, MD, CHRISTOPHER F. WOLF, BS,
WILLIAM J. HOZACK, MD, PETER F. SHARKEY, MD, AND JAMES J. PURTILL, MD

Investigation performed at the Rothman Institute of Orthopedics at Thomas Jefferson University, Philadelphia, Pennsylvania

Message: High complication rate, but a viable option for the treatment of the periprosthetic fractures in older patients with severe bone deficiency. In order to enhance the bone stock, the proximal part of the femur, however poor in quality, should be retained for re-approximation on to the implant.



Conclusions



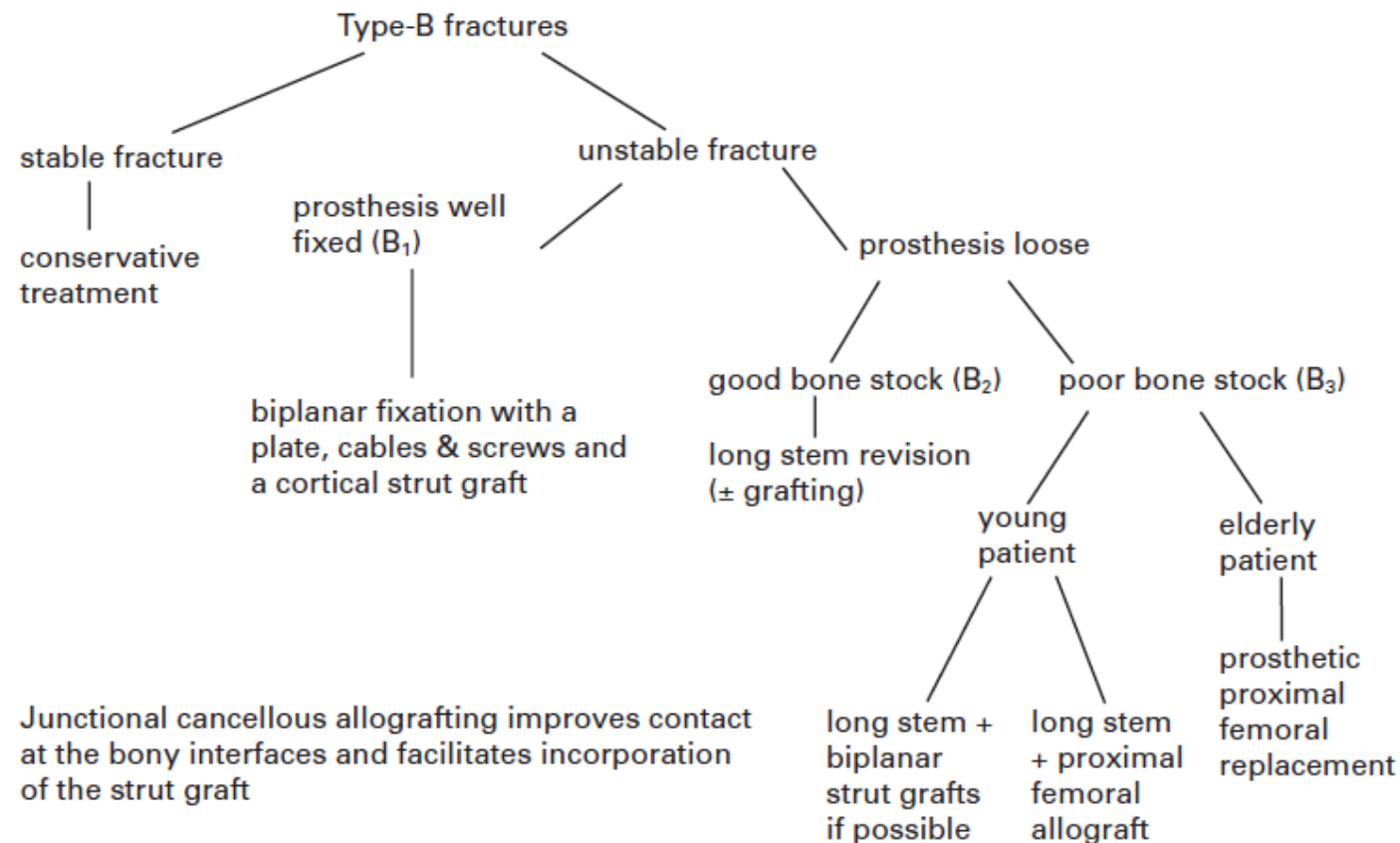
Aspects of current management

THE MANAGEMENT OF PERIPROSTHETIC FRACTURES AROUND THE FEMORAL STEM

©2004 British Editorial Society of Bone and Joint Surgery
doi:10.1302/0301-620X.86B1.14864 \$2.00
J Bone Joint Surg [Br] 2004;86-B:13-9.

I. D. Learmonth

From Bristol Royal Infirmary, Bristol, England



•Conclusions

- Rare cases
- The results with various techniques are comparable
- In young adults operations restoring bone stock
- In old adults a replacement implant
- Last resort proximal femoral excision

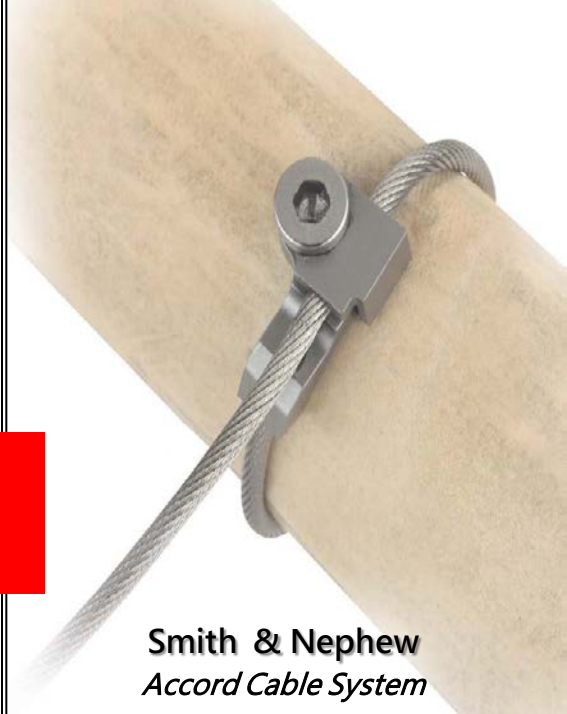




Zimmer
Cable Ready Cable Grip System

Dall-Miles™ Recon & Trauma Cable System

Stryker
Dall-Miles Cable System
Trochanteric Cable Grip System



Smith & Nephew
Accord Cable System

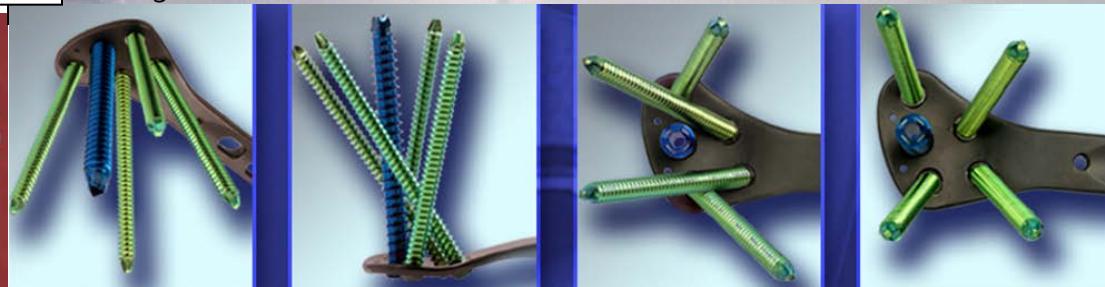
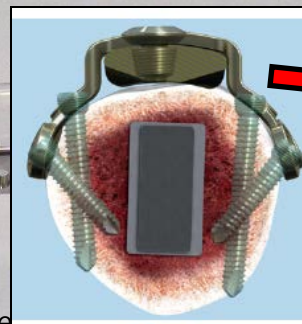
THANK YOU



DePuy
Control Cable and Wire system



Synthes
Locking Attachment Plate



DePuy
Distal Femoral Polyaxial plating system